

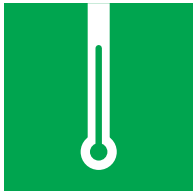


# Annual Environmental Report 2001



**EAST JAPAN RAILWAY COMPANY**

Committee on Ecology



## 2. Global Environmental Conservation

Disruption of the global environment has become an important concern for all of us. Global warming—recognized to be caused by greenhouse gases such as CO<sub>2</sub>—could have a seriously detrimental impact on our future, in terms of both time and space. The effects of further global warming include a change in global climate patterns, which will in turn effect ecosystems worldwide.

The Kyoto Protocol, ratified at the Third Session of the Conference of the Parties to the United Nations Framework Convention on Climate Change in 1997, aims to reduce global CO<sub>2</sub> emissions by 5.2% of 1990 levels between 2008 and 2012, with target reductions of 6%, 7%, and 8% for Japan, the U.S., and Europe, respectively.

As the unit of CO<sub>2</sub> emission from railways in proportion

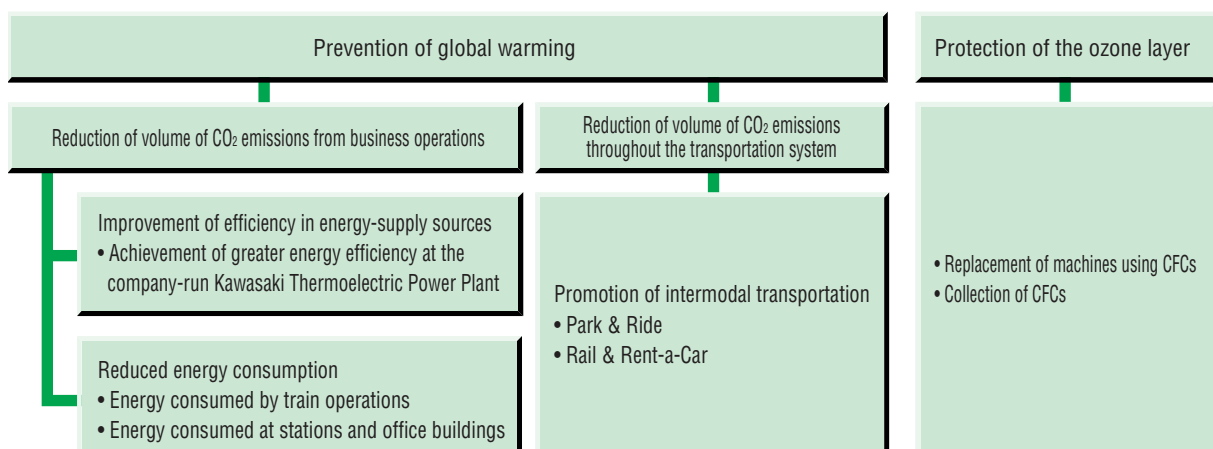
to transportation volume is low in comparison to other means of transportation, railways are considered a relatively environmentally friendly means of getting from one point to the next. Moreover, electric trains do not actually emit any CO<sub>2</sub> in operation, since their power source is electricity.

In spite of this, the volume of energy consumed by JR East totaled 59 billion MJ (equivalent to 1.53 million kl of crude oil) in fiscal 2000, resulting in indirect emission of a significant volume of CO<sub>2</sub>—an amount equivalent to 0.2% of Japan's total emissions. By stepping up our efforts to reduce energy consumption and CO<sub>2</sub> emissions, JR East is contributing to the prevention of global warming.

### Goals and progress

Item	Target value (to be met by fiscal 2005)	Fiscal 2000		Reference value (figure from fiscal 1990)
		Actual achievement	Value achieved	
CO <sub>2</sub> emissions in general business activities	20%	12%	2.44 million t-CO <sub>2</sub>	2.76 million t-CO <sub>2</sub>
CO <sub>2</sub> emissions in proportion to unit electric power generation at company-run thermoelectric power plant	30%	25%	544 g-CO <sub>2</sub> /kWh	726 g-CO <sub>2</sub> /kWh
Ratio of energy-saving railcars	80%	59%	—	—
Energy consumption for train operations in proportion to unit transportation volume	15%	4%	19.7 MJ/car-km	20.6 MJ/car-km
Number of large-size refrigerating machines using specific CFCs	85%	63%	30 units	82 units

### JR East's efforts on behalf of global environmental conservation





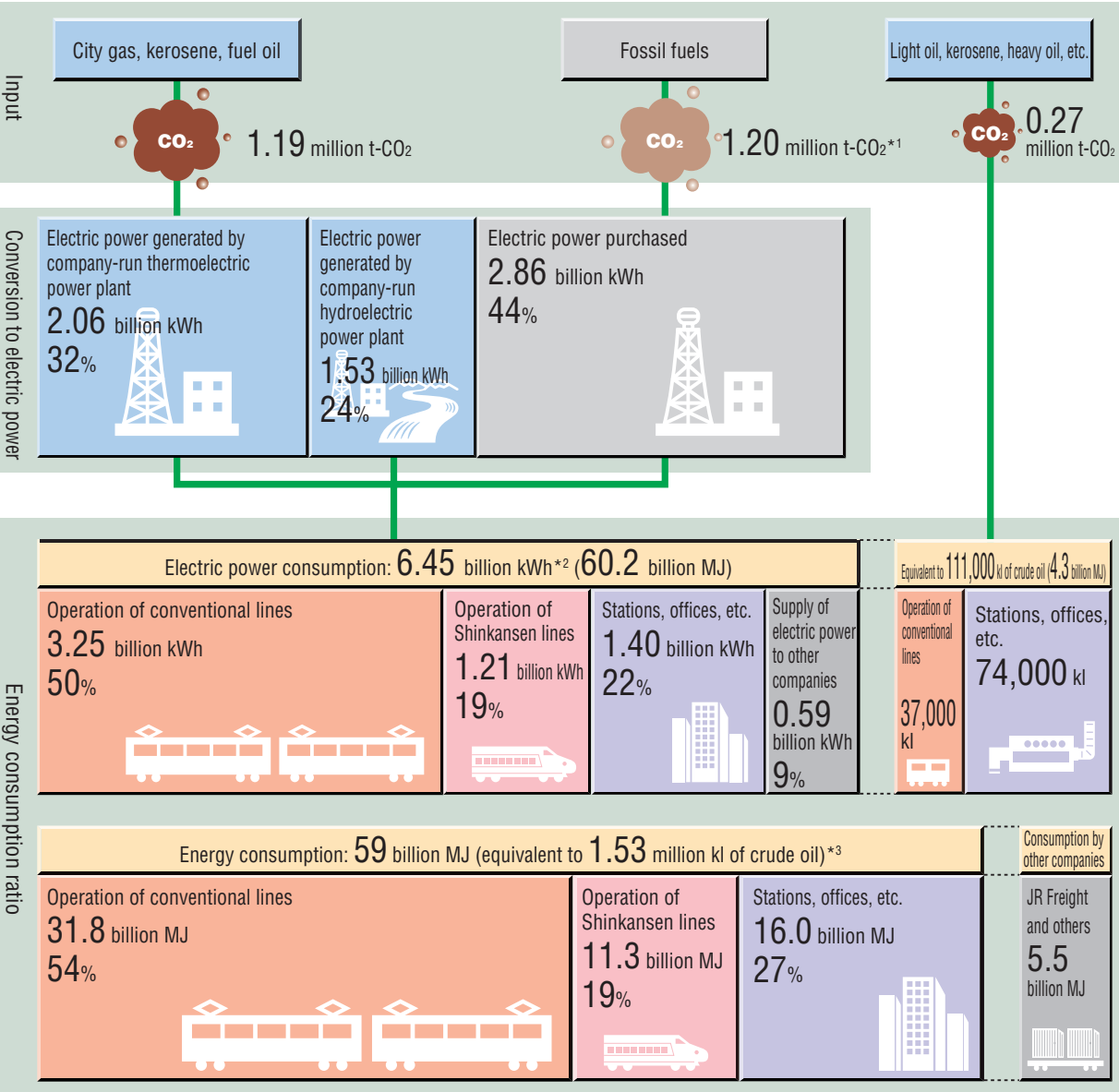
## Energy supply and consumption by JR East

The supply of energy for JR East consists of electric power, which is generated by the company-run Kawasaki Thermoelectric Power Plant (Kawasaki, Kanagawa Prefecture) and Shinanogawa Hydroelectric Power Plant (Ojiya, Niigata Prefecture), along with electric power purchased from power

companies and other types of fuel.

Electric power and fuel are used for train operations, as well as for lighting apparatus and air-conditioning equipment at our stations and offices. We also supply electric power to other companies, such as Japan Freight Railway Company (JR Freight), which also run on our tracks.

### Energy map for JR East



\*1 As figures represent a historical comparison, the Federation of Electric Power Companies Japan CO<sub>2</sub> emission coefficient for fiscal 1990 is used; substitution of the fiscal 1999 coefficient would result in a figure of 1.06 million tons.  
 \*2 Equivalent to the annual electric power consumption of 1.82 million households (34% of the households in the Tokyo Metropolis). (*Electric Power Annual*, Federation of Electric Power Companies Japan)  
 \*3 Equivalent to 1.23 times the estimated capacity of the Tokyo Dome stadium.

## Energy savings/Reduction of CO<sub>2</sub> emissions

### Volume of energy consumption and CO<sub>2</sub> emissions

Electric power accounts for 93% of the total energy consumed by JR East, with 56% of this electric power supplied by our own power plants. It is therefore essential that we enhance the efficiency of these plants and reduce energy consumption in our trains, stations, and offices. By doing so, we can reduce energy consumption for our business operations and achieve a corresponding reduction in CO<sub>2</sub> emissions. Through measures such as these, energy consumed through JR East's business operations in fiscal 2000 was 59 billion MJ (equivalent to 1.53 million kl of crude oil), while the volume of CO<sub>2</sub> emissions was 2.44 million tons, a 4% reduction from the previous fiscal year. Compared to the figures from fiscal 1990, the total CO<sub>2</sub> emission volume decreased 12%, and the volume of energy consumption stayed at the same level.

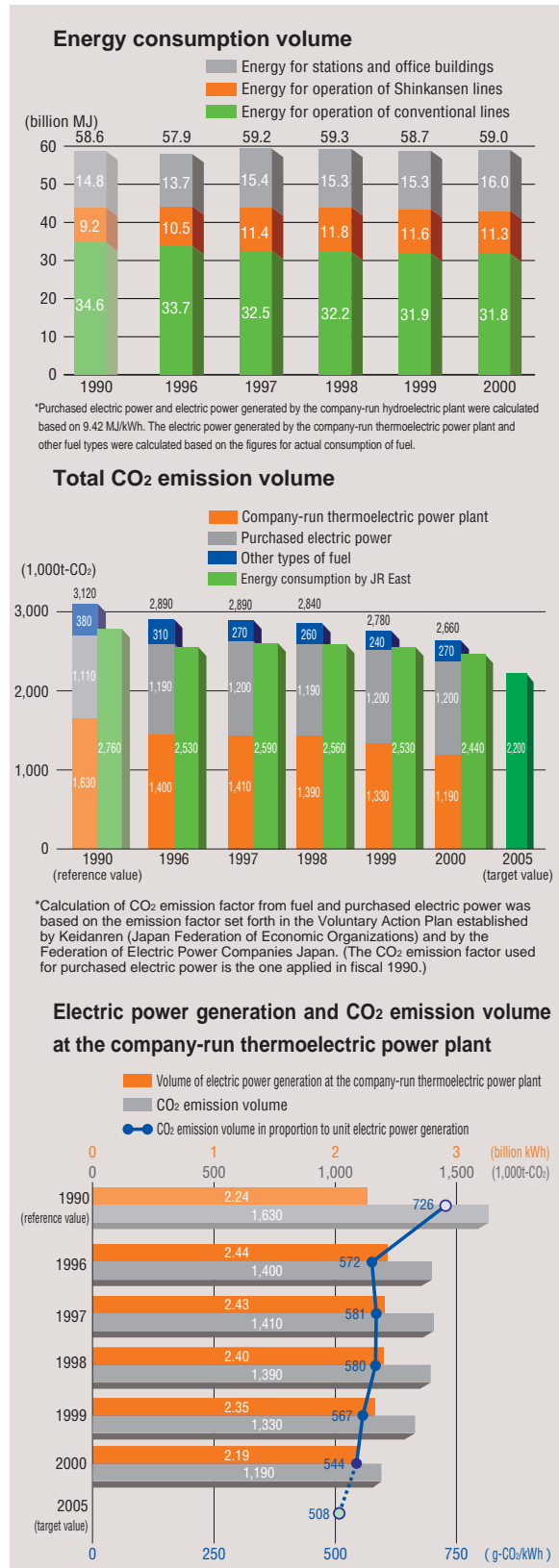
### Achieving greater energy efficiency at our thermoelectric power plant

We are in the process of replacing the four power-generating units at our Kawasaki Thermoelectric Power Plant with combined-cycle units\*. Unit No. 2 was replaced in fiscal 1993, followed by No. 3 in fiscal 1999. By optimizing the operation of these power-generating units, CO<sub>2</sub> emissions in fiscal 2000 totaled 1.19 million tons while the emission volume in proportion to unit electric power generation was 544 g-CO<sub>2</sub>/kWh. This figure represents a 25% reduction from levels recorded in fiscal 1990.

\* Combined-cycle power-generating unit: A power-generating unit that combines gas turbines (turbines are rotated by gas combustion) and steam turbines (heated steam is used to rotate turbines).

### Effective use of hydropower generation

Our Shinano River Hydroelectric Power Plant is a clean source of power that generates very limited emissions of such substances as CO<sub>2</sub>, NO<sub>x</sub>, and SO<sub>x</sub>. In fiscal 2000, volume of electric power increased by 8% over fiscal 1999, contributing to JR East's efforts to cut CO<sub>2</sub> emissions.



### Reducing energy consumption in train operations

Train operations account for fully 73% of JR East's energy consumption. In order to reduce this energy requirement, we are in the process of introducing energy-saving railcars such as the E231 series for local trains on the Sobu, Utsunomiya, and Takasaki lines. As a result, in fiscal 2000, the energy required to move one rail car one kilometer declined to 19.7 MJ.

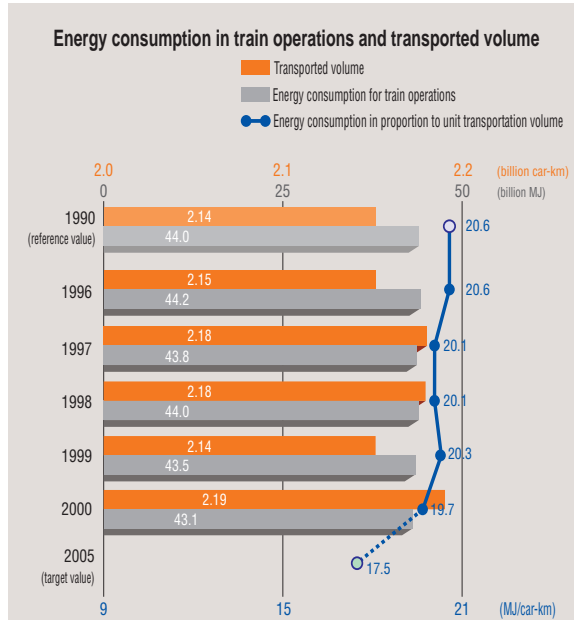
On our conventional rail lines, we operate several types of energy-saving railcars such as the new 205 series on the Yamanote Line, and VVVF cars such as the E231 series on the Sobu and other lines. By reducing weight and using regenerative brakes\*1, the new model cars reduce operating power consumption to 66% of such older models as the 103 series. VVVF cars likewise reduce operating power consumption to just 47% of older models through the use of VVVF inverter control\*2. We are also developing next-generation AC Train commuter trains, designed to further reduce energy consumption.

In order to reduce energy consumption, we also have introduced new types of diesel railcars such as the Kiha 100 and 110 series, featuring lighter bodies and new engines, and refitted older railcars with new fuel-efficient engines.

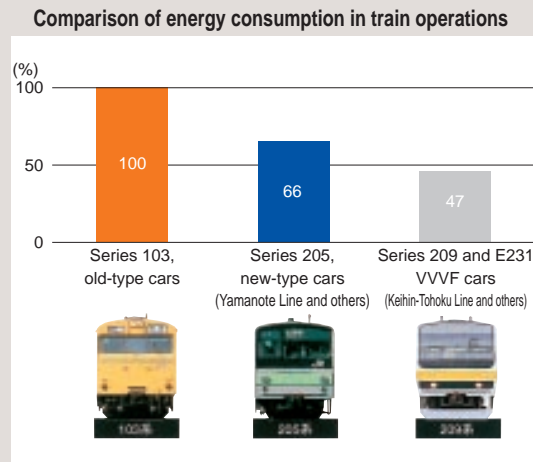
As of the end of March 2001, energy-saving railcars accounted for 59% of our rolling stock.

\*1 Regenerative brake: A brake that uses a motor to generate electric power during application for subsequent use as electricity.

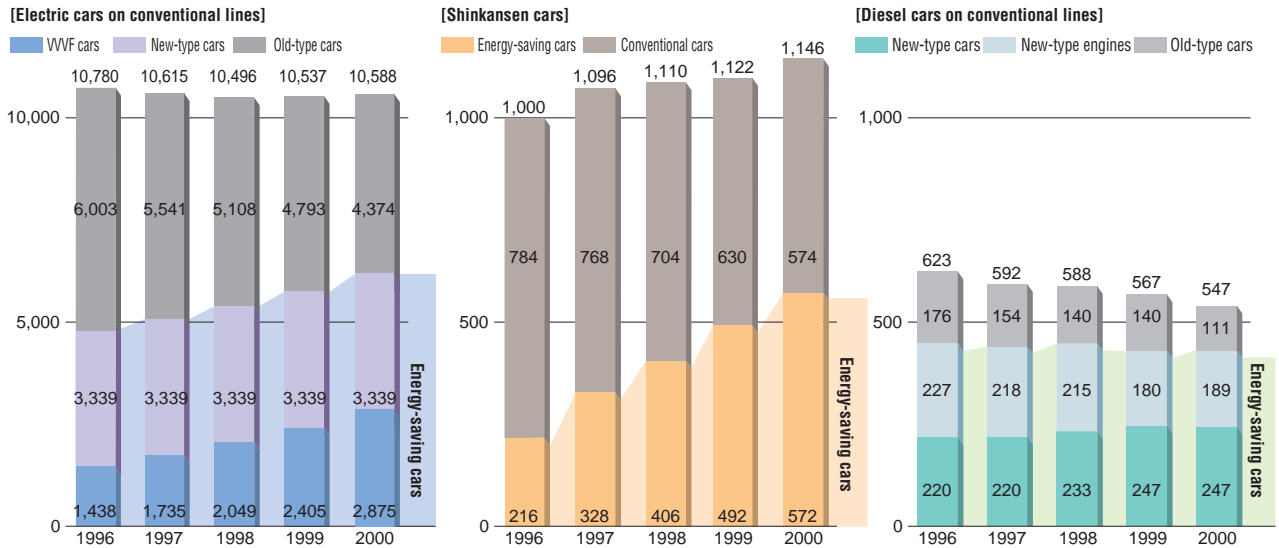
\*2 VVVF inverter control: VVVF stands for "variable voltage variable frequency," an inverter that can efficiently control train speed.



Energy-saving cars (E231 Series)



## Introduction of energy-saving cars

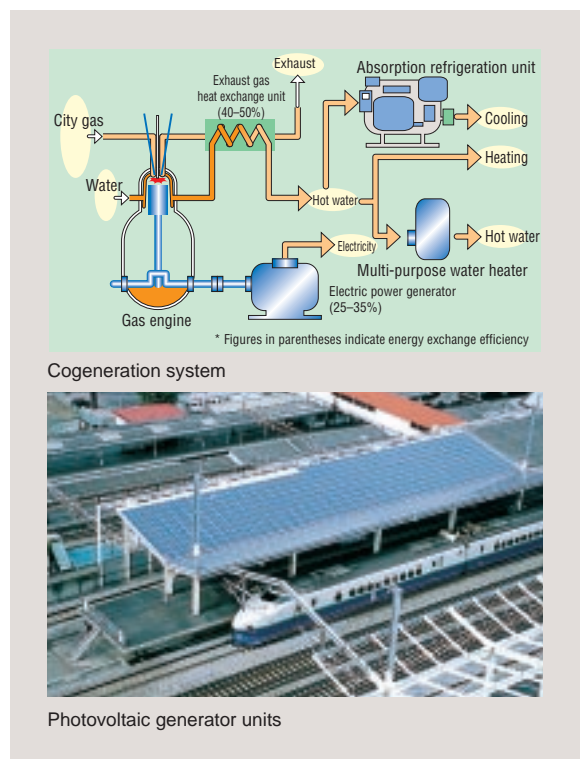


## Energy savings at stations and office buildings

We are working to introduce more energy-efficient facilities and enhance the productivity of our existing machinery to ensure reduction of energy consumption at stations and office buildings.

Furthermore, as a means of bringing more efficiency to energy-supply systems at stations and other facilities, we have introduced cogeneration systems at the Machida Station building, Sendai Station building, and the General Training Center (Shirakawa, Fukushima Prefecture) among others, and have introduced gas heat pumps at four stations, including Shinjo Station on the Yamagata Shinkansen Line.

Photovoltaic generators have been installed on the roof of the Shinkansen platform at Tokyo Station and on the roof of the training building at the General Training Center. A photovoltaic generator has also been integrated into the material of the roof over the Shinkansen platform at Takasaki Station.





**Reduction of CO<sub>2</sub> emissions throughout the transportation system**

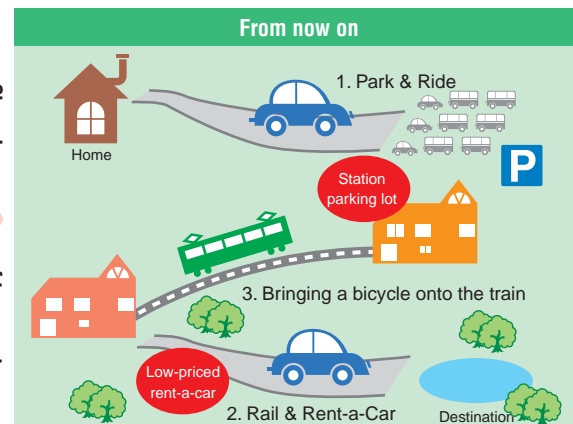
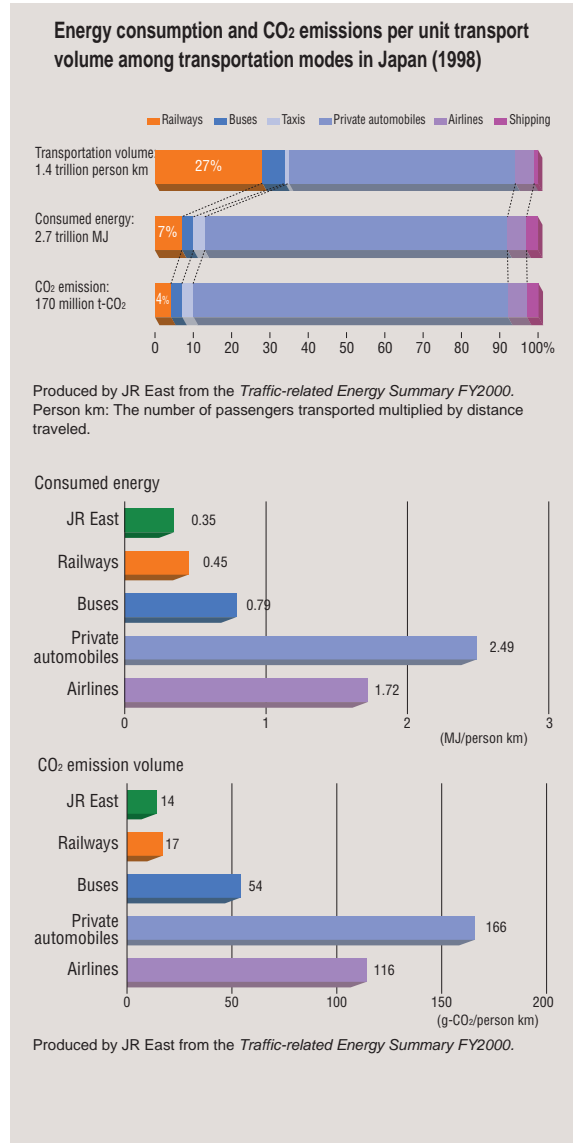
Railways account for 27% of all the transportation of people within Japan. Despite that high share, energy consumption and the CO<sub>2</sub> emission volume account for just 7% and 4%, respectively. As such, railways impose less of an environmental burden than other modes of transportation. Figures for unit transportation volume also support this point. JR East has consistently implemented measures to enable it to transport people with even less stress on the environment.

**Intermodal transportation**

While railways are environmentally superior to automobiles, they are unable to closely satisfy the requirements of individual users, as routes and destinations are fixed. JR East is therefore promoting intermodal transportation that integrates automobile use before and after using rail services.

**1) Park & Ride**

JR East is promoting the Park & Ride concept of having users drive to their local rail stations in their own automobiles, park, then ride trains to their final destinations. Park & Ride parking lots are available for use free of charge, or at a discount, by customers with express tickets. In fiscal 2000, JR East alone prepared 1,500 parking spots. Since 1994, we have prepared a total of 4,800 parking stalls. In addition, parking lots have been also set up with the cooperation of municipalities along rail lines.



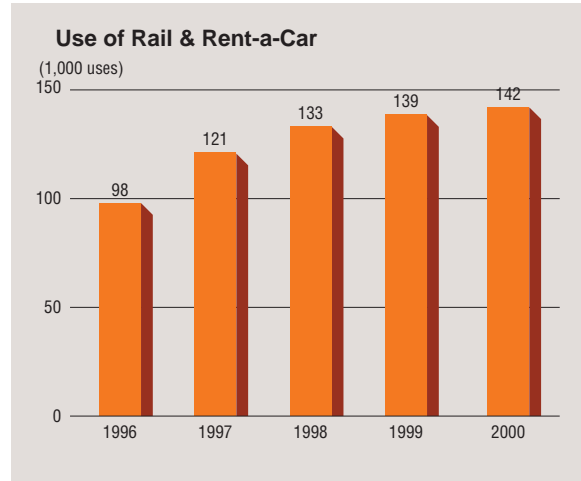
Choosing a means of transport that offers reduced environmental burden

Image of intermodal transportation



## 2) Rail & Rent-a-Car

JR East is promoting a Rail & Rent-a-Car travel program that combines the use of rail with reasonably priced rental cars. Customers who buy JR tickets and rent-a-car tickets at the same time, and who satisfy certain requirements, are offered discounts on both the rail and car rental portions. In 1995, JR East began offering its Torenta-Kun discount car rental service which was priced at roughly half the typical market rate. Also, as an endeavor to further reduce environmental impact, we are introducing eco-friendly hybrid automobiles at a few rent-a-car offices in our rail stations.



Rail & Rent-a-Car

## 3) Bringing bicycles onto the train

JR East recommends that customers make their train trips more fun and environmentally friendly with the use of bicycles. In November 1998, we developed and marketed the Traincle lightweight bicycle, which is collapsible for easy storage in a coin-operated locker. Furthermore, we revised our business regulations concerning the charge for carrying collapsible bicycles onto trains. This means our customers can now bring bicycles onto the trains for free. All that is required is that the bicycle be placed in a bag.



Traincle



## Ozone layer-depleting substances and other greenhouse gases

### Replacement of facilities reliant on specific CFCs

Certain types of CFCs used as coolants in the air-conditioning systems of large buildings are said to destroy the earth's ozone layer. The same could be said for halon gas, which is used in the fire extinguisher systems of facilities such as substations.

JR East is replacing its old facilities with ones that are free of specific CFCs and halon gas. In particular, we are systematically replacing large-size refrigeration machines with high-efficiency, specific CFC-free models. Accordingly, the number of large, specific CFC-based refrigeration machines went from 82 in fiscal 1990 to 30 in fiscal 2000, a drop of 63%.

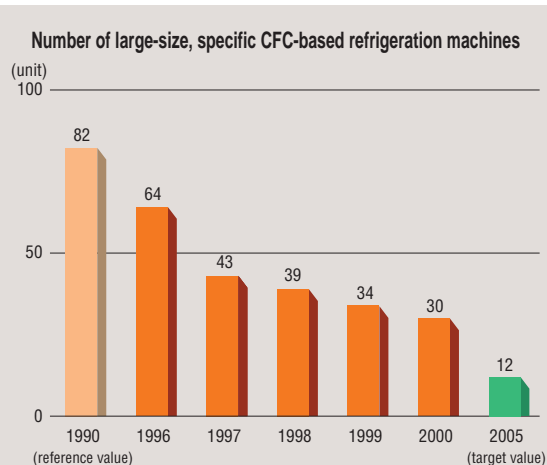
Halon, used as a fire extinguishing agent, is recovered in coordination with the Halon Bank Promotion Committee when dismantling halon-using facilities. We no longer use halon when installing new fire extinguishing systems.

### Railcar air-conditioning systems

For the air-conditioning systems of our railcars, some diesel cars are equipped with specific CFC-based air-conditioning systems. Other than those railcars, however, we have switched over to new CFC substitutes. When dismantling railcars and air-conditioning systems, we recover all leftover CFCs. On new railcars, we use CFC substitutes that have minimum impact on the ozone layer, such as R407C.

### Other greenhouse gases

Apart from CO<sub>2</sub>, JR East also uses HFCs (hydrofluorocarbons) for air conditioning in trains, and PFCs (perfluorocarbons) and SF<sub>6</sub> (sulfur hexafluoride) in trains as well as for power generation and conversion. The use of such substances is restricted, however, within tightly packaged products, so there is normally no emission into the air. Nonetheless, we are extremely careful when using these products. We endeavor to prevent leakage during maintenance operations and scrapping, at which time discarded containers are processed in the appropriate manner.



Equipment to collect CFCs and CFC substitutes used in trains